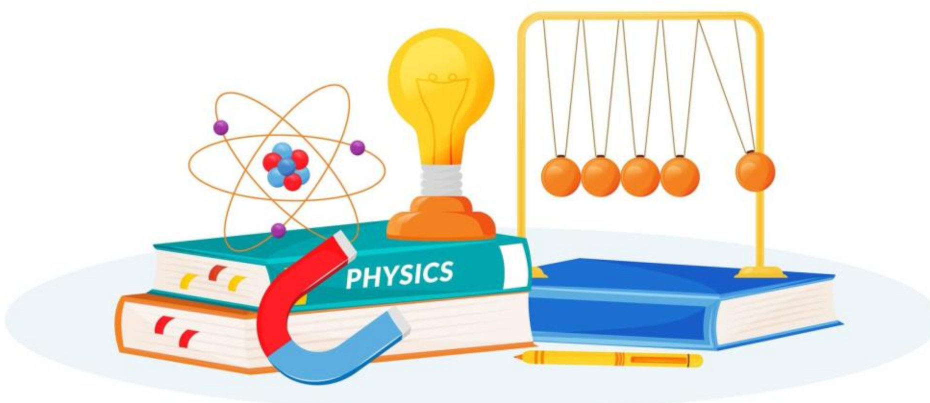
مؤسسة الإمارات للتعليم المدرسي
EMIRATES SCHOOLS ESTABLISHMENT

GRADE 10 GENERAL – FINAL PHYSICS REVISION – TERM 1

2023 - 2024



Name: …………………………………………….

Class: ……………………………………..……

Number of MCQ عدد الأسئلة الموضوعية	15
Marks of MCQ درجة الأسئلة الموضوعية	4
Number of FRQ عدد الأسئلة المقالية	5

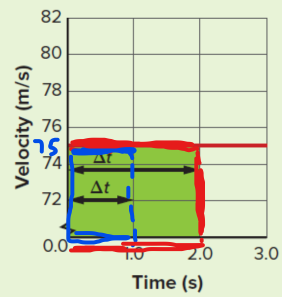
Marks per FRQ الدرجات للأسئلة المقالية	04-Oct
Type of All Questions نوع كافة الأسئلة	MCQ/ الأسئلة الموضوعية FRQ/ الأسئلة المقالية
Maximum Overall Grade الدرجة القصوى الممكنة	100
Exam Duration - مدة الامتحان	150 minutes

<table>
<tr><th colspan="4">قوانين عاشر عام ف 1</th></tr>
<tr><td colspan="4">A Physics Toolkit   1 - مدخل الى الفيزياء</td></tr>
<tr><td>$\textbf{Slope} = m = \frac{rise}{run} = \frac{\Delta y}{\Delta x}$</td><td>$y = mx + b$</td><td>$y = a\,x^2 + bx + c$</td><td>$y = \frac{a}{x}$</td></tr>
<tr><td colspan="4">REPRESENTING MOTION   2 - وصف الحركة</td></tr>
<tr><td>$R = A + B$
$R = A - B$</td><td>$\Delta t = t_f - t_i$
$\Delta X = x_f - x_i$</td><td colspan="2">$Slop = \vec{v}_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$</td></tr>
<tr><td colspan="2">$Average\ Speed = v_{avg} = \frac{\Delta x}{\Delta t} = \left|\frac{x_f - x_i}{t_f - t_i}\right|$</td><td colspan="2">$x_f = vt + x_i$</td></tr>
<tr><td colspan="4">Accelerated motion   3 - الحركة المتسارعة</td></tr>
<tr><td rowspan="2">$a_{avg} = slop = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$</td><td>معادلات الحركة بعجلة ثابتة</td><td colspan="2">معادلات الحركة للسقوط الحر</td></tr>
<tr><td>$v_f = v_i + a\,t$
$v_f^2 = v_i^2 + 2a\,\Delta x$
$\Delta x = \frac{1}{2}(v_i + v_f)\,t$
$\Delta x = v_i\,t + \frac{1}{2}\,a\,t^2$</td><td colspan="2">$v_f = v_i + g\,t$
$v_f^2 = v_i^2 + 2g\,\Delta y$
$\Delta y = \frac{1}{2}(v_i + v_f)\,t$
$\Delta y = v_i\,t + \frac{1}{2}\,g\,t^2$</td></tr>
<tr><td colspan="4">$g = -9.81\ m/s^2$</td></tr>
</table>

1	Relate the slope of a velocity time graph to the average acceleration of the object in motion	example 3	68

EXAMPLE Problem 3

FINDING DISPLACEMENT FROM A VELOCITY-TIME GRAPH The velocity-time graph at the right shows the motion of an airplane. Find the displacement of the airplane for $\Delta t = 1.0$ s and for $\Delta t = 2.0$ s. Let the positive direction be forward.



1 ANALYZE AND SKETCH THE PROBLEM

- The displacement is the area under the *v-t* graph.
- The time intervals begin at $t = 0.0$ s.

KNOWN	UNKNOWN
$v = +75$ m/s	$\Delta x = ?$
$\Delta t = 1.0$ s	
$\Delta t = 2.0$ s	

2 SOLVE FOR THE UNKNOWN

Use the relationship among displacement, velocity, and time interval to find Δx during $\Delta t = 1.0$ s.

$$\Delta x = v\Delta t$$
$$= (+75\text{ m/s})(1.0\text{ s})$$ Substitute $v = +75$ m/s, $\Delta t = 1.0$ s.
$$= +75\text{ m}$$

Use the same relationship to find Δx during $\Delta t = 2.0$ s.

$$\Delta x = v\Delta t$$
$$= (+75\text{ m/s})(2.0\text{ s})$$ Substitute $v = +75$ m/s, $\Delta t = 2.0$ s.
$$= +150\text{ m}$$

displacement = Area = L x W

for $\Delta t = 1.0$ Area = 75 x 1.0 = 75 m

for $\Delta t = 2.0$ Area = 75 x 2.0 = 150 m

2	Apply the equation of motion relating the final velocity of an object to its initial velocity, uniform acceleration, and time (vf = vi + at)	problems 5,6	63

5. A race car's forward velocity increases from 4.0 m/s to 36 m/s over a 4.0-s time interval. What is its average acceleration?
6. The race car in the previous problem slows from 36 m/s to 15 m/s over 3.0 s. What is its average acceleration?

v_i v_f t a

v_i v_f t a

Answer:

(5) $a = \dfrac{v_f - v_i}{\Delta t}$

$= \dfrac{36 - 4.0}{4.0} = 8$ m/s²

(6) $a = \dfrac{15 - 36}{3.0} = -7$ m/s²

3	Use appropriate significant figures to record answers from a mathematical operation, with the correct number of digits	problem 8	13

8. **Significant Figures** Solve the following problems, using the correct number of significant figures each time.
   a. 10.8 g – 8.264 g
   b. 4.75 m – 0.4168 m
   c. 139 cm × 2.3 cm
   d. 13.78 g / 11.3 mL
   e. 1.6 km + 1.62 m + 1200 cm

Km $\times 10^3$

cm $\times 10^{-2}$

يجب توحيد units

الجواب حسب عدد المنازل الأقل بعد Point الأقل

Answer:

(a) 10.8 – 8.264 = 2.536 = 2.5 g

(b) 4.75 – 0.4168 = 4.3332 = 4.33 m

(c) 139 x 2.3 = 319.7 = 320 = 3.2×10^2 cm

(d) 13.78 / 11.3 = 1.219469027 = 1.22 g/mL

(e) $1.6 \times 10^3 + 1.62 + 1200 \times 10^{-2}$ = 1613.62 m = 1614 = 1.6×10^3 = 1600 m

الجمع والطرح نعد الارقام بعد الفاصلة والجواب حسب عدد المنازل الاقل.

الضرب والقسمة نعد الارقام المعنوية جميعها والجواب حسب عدد المنازل الاقل

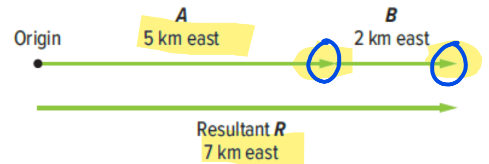
4	Differentiate between distance travelled and displacement	figure 10	37

Figure 10 You can use a diagram or an equation to combine vectors.
Analyze *What is the sum of a vector 12 m north and a vector 8 m north?*

COLOR CONVENTION
Displacement (x) → green

Example of Vector Addition

same direction Add

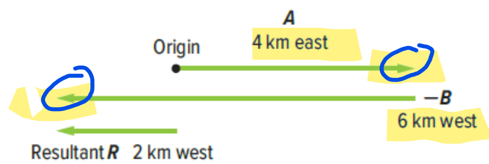


$R = A + B$
$= 5\text{ km} + 2\text{ km}$
$= 7\text{ km}$

$R = A + B$
$= 7\text{ km east}$

Examples of Vector Subtraction

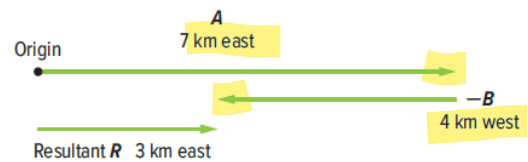
opposite direction subtract



$R = A - B$
$= 4\text{ km} - 6\text{ km}$
$= -2\text{ km}$

$R = A - B$
$= A + (-B)$
$= 2\text{ km west}$

اتجاه الاكبر



$R = A - B$
$= 7\text{ km} - 4\text{ km}$
$= 3\text{ km}$

$R = A - B$
$= A + (-B)$
$= 3\text{ km east}$

اتجاه الاكبر

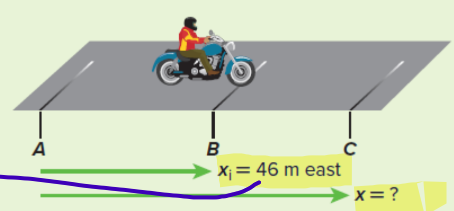
5	Apply the equation of motion, (xf = vavgt + xi) or (xf - xi = vavgt), in numerical problems to calculate the position or other physical quantities	exmple 4	48

EXAMPLE Problem 4

POSITION The figure shows a motorcyclist traveling east along a straight road. After passing point **B**, the cyclist continues to travel at an average velocity of 12 m/s east and arrives at point **C** 3.0 s later. What is the position of point **C**?

1 ANALYZE THE PROBLEM

Choose a coordinate system with the origin at **A**.



KNOWN	UNKNOWN
$\bar{v} = 12$ m/s east	$x = ?$
$x_i = 46$ m east	
$t = 3.0$ s	

2 SOLVE FOR THE UNKNOWN

$x = \bar{v}t + x_i$ — Use magnitudes for the calculations.

$= (12\text{ m/s})(3.0\text{ s}) + 46\text{ m}$ — Substitute $\bar{v} = 12$ m/s, $t = 3.0$ s, and $x_i = 46$ m.

$= 82\text{ m}$

$x = 82$ m east

3 EVALUATE THE ANSWER

Are the units correct? Position is measured in meters.

Does the direction make sense? The motorcyclist is traveling east the entire time.

6	Classify physical quantities into vector and scalar quantities (distance, mass, displacement, speed, velocity, acceleration, force, work, energy, pressure)	as mentioned in the book	34

Vectors and Scalars

As you might imagine, there are many kinds of measurements and numbers used to represent or describe motion. If you needed to describe how far you ran, you might say that you ran 1.6 km. If you needed to run to a specific location, you might say that you ran 1.6 km north. Many quantities in physics have both size, also called **magnitude**, and direction. A quantity that has both magnitude and direction is called a **vector.** You can represent a vector with an arrow. The length of the arrow represents the magnitude of the vector, and the direction of the arrow represents the direction of the vector. A quantity that is just a number without any direction, such as distance, time, or temperature, is called a **scalar.** In this textbook, we will use boldface letters to represent vector quantities and regular letters to represent scalars.

Scalars	Vectors
distance	velocity
temprature	Force
time	weight
speed	displacement
mass	acceleration

7	Apply the alternative equation of motion relating an object's final velocity to its initial velocity, its constant acceleration, and its initial and final positions (v2f = v2i + 2a(xf - xi))	problem 16	67

16. A golf ball rolls up a hill toward a miniature-golf hole. Assume the direction toward the hole is positive.

a. If the golf ball starts with a speed of 2.0 m/s (v_i) and slows at a constant rate of 0.50 m/s² ($-a$), what is its velocity (v_f) after 2.0 s (t)?

b. What is the golf ball's velocity if the constant acceleration continues for 6.0 s?

c. Describe the motion of the golf ball in words and with a motion diagram.

Answer:

(a) $v_f = v_i + at$

$= 2.0 + (-0.50 \times 2.0)$

$= 1.0$ m/s

(b) $v_f = 2.0 + (-0.50 \times 6.0) = -1$ m/s

(c) velocity decrease

8	Define a coordinate system and identify the origin, position, and distance in a coordinate system	figure 9	36

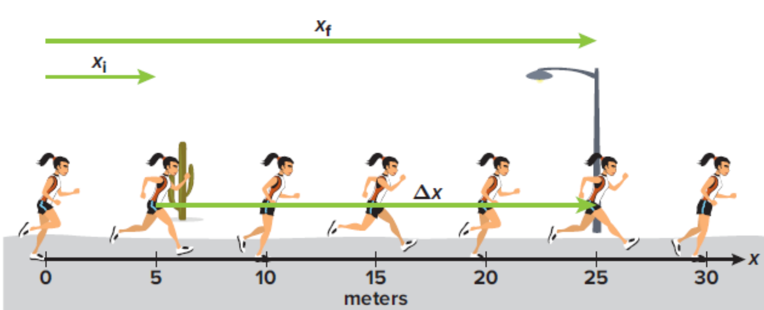


Figure 9 The vectors x_i and x_f represent positions. The vector Δx represents displacement from x_i to x_f.

Describe *the displacement from the lamppost to the cactus.*

$\Delta x = x_f - x_i$

displacement

9	Describe the motion of an object if its velocity and acceleration are either in the same directions or opposite directions, hence state if an object is slowing down or speeding up	as mentioned in the book	57
11	Recognize uniform or non-uniform motion from a motion diagram or a particle model	figure 2	57

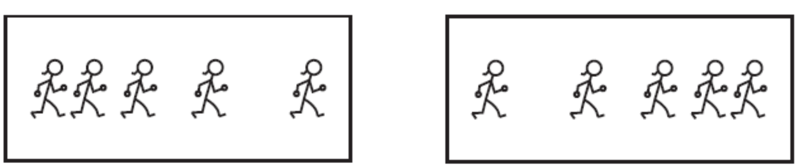


Figure 2 The change in length of the velocity vectors on these motion diagrams indicates whether the jogger is speeding up or slowing down.

Speeding up

slowing down

constant velocity

10	Define and calculate the average acceleration	problem 12	64

12. **Position-Time and Velocity-Time Graphs** Two joggers run at a constant velocity of 7.5 m/s east. **Figure 10** shows the positions of both joggers at time $t = 0$.

a. What would be the difference(s) in the position-time graphs of their motion?

b. What would be the difference(s) in their velocity-time graphs?

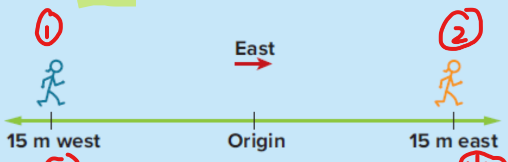


Figure 10

Answer:

ⓐ both have same slope but y intercept different +15 m −15 m

ⓑ velocity time graph would be identical

12	Calculate the displacement as the area under the curve of a velocity-time graph	problem 2	62

2. Use the *v-t* graph of the toy train in **Figure 9** to answer these questions.
   - **a.** When is the train's speed constant?
   - **b.** During which time interval is the train's acceleration positive?
   - **c.** When is the train's acceleration most negative?
3. Refer to **Figure 9** to find the average acceleration of the train during the following time intervals.
   - **a.** 0.0 s to 5.0 s **b.** 15.0 s to 20.0 s **c.** 0.0 s to 40.0 s

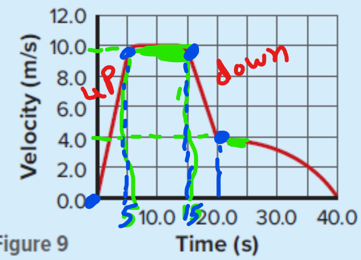


Figure 9

Answer:

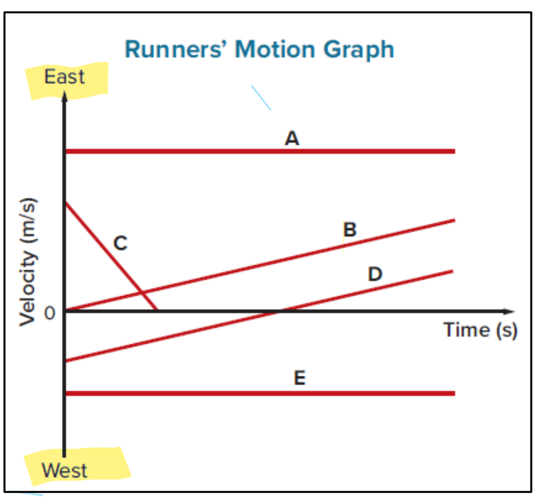
② ⓐ $t = 5 \Rightarrow t = 15$ s

ⓑ acceleration (+) ⇒ up $t = 0 \Rightarrow t = 5.0$ s

ⓒ $a = (-)$ ⇒ down ⇒ $t = 15 \Rightarrow t = 20$ s

③ ⓐ slope $= a = \frac{v_f - v_i}{t_f - t_i} = \frac{10-0}{5-0} = 2\ m/s^2$ ⓑ $a = \frac{4-10}{20-15} = -1.2\ m/s^2$ ⓒ $a = \frac{0-0}{40-0} = 0$

14	Interpret the velocity-time graph for a single or multiple objects in motion	figure 6	59



Reading velocity-time graphs The motions of five runners are shown in **Figure 6.** Assume that the positive direction is east. The slopes of Graphs A and E are zero. Thus, the accelerations are zero. Both graphs show motion at a constant velocity—Graph A to the east and Graph E to the west. Graph B shows motion with a positive velocity eastward. Its slope indicates a constant, positive acceleration. You can infer that the speed increases because velocity and acceleration are positive. Graph C has a negative slope. It shows motion that begins with a positive velocity, slows down, and then stops. This means the acceleration and the velocity are in opposite directions. The point at which Graphs C and B cross shows that the runners' velocities are equal at that time. It does not, however, identify their positions.

15	Define displacement as the change in an object's position Define average velocity and average acceleration	as mentioned in the book	34 44, 60

The symbol Δx represents the change in position from the cactus to the lamppost. Because a change in position is described and analyzed so often in physics, it has a special name. In physics, a change in position is called a **displacement**. Because displacement has both magnitude and direction, it is a vector.

Average velocity

Average velocity is defined as the change in position divided by the time during which the change occurred.

$$\bar{v} \equiv \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

a acceleration (m/s²)

The **average acceleration** of an object is its change in velocity during some measurable time interval divided by that time interval. Average acceleration is measured in meters per second per second (m/s/s), or simply meters per second squared (m/s²).

$$a = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{\Delta t}$$

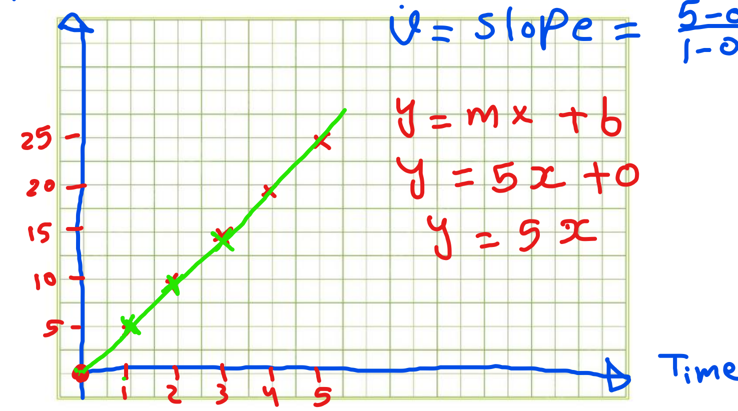
v velocity (m/s)
x position (m)
t time (s)

16	Plot a position-time graph given position-time values.	table 1 and figure 11	38

Table 1 Position v. Time

Time (s)	Position (m)
0.0	0.0
1.0	5.0
2.0	10.0
3.0	15.0
4.0	20.0
5.0	25.0

position



$v = \text{slope} = \frac{5-0}{1-0} = 5$ m/s

$y = mx + b$

$y = 5x + 0$

$y = 5x$

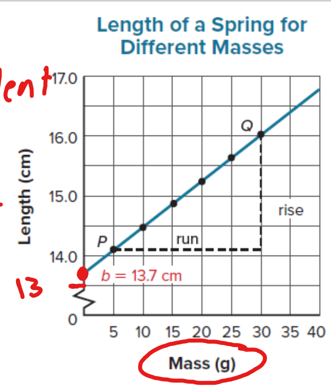
17	Represent data in graphical form, draw the best fit line, and identify from the shape of the graph if the relationship between the variables is linear, quadratic or inverse Find the slope from the graph of a linear relationship	as mentioned in the book	20-22

اعطيتها

independent
x Mass

dependent
y length

13



When the line of best fit is a straight line, as in **Figure 15**, there is a linear relationship between the variables. In a **linear relationship**, the dependent variable varies linearly with the independent variable. The relationship can be written as the following equation.

Linear Relationship Between Two Variables

$$y = mx + b$$

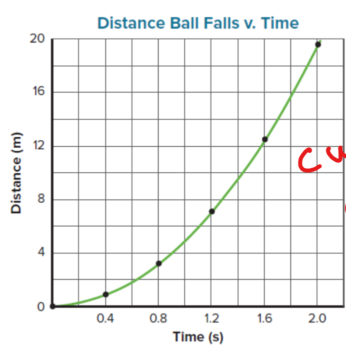
start with y 13.7

Slope

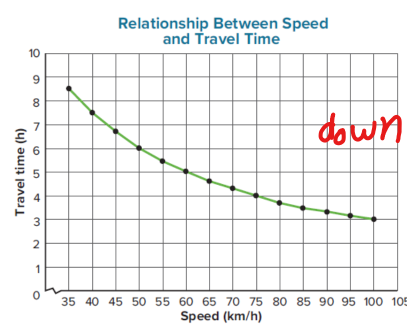
The slope of a line is equal to the rise divided by the run, which also can be expressed as the vertical change divided by the horizontal change.

slope $$m = \frac{rise}{run} = \frac{\Delta y}{\Delta x}$$

غطيها على شكل ودامو



curve
منحنى



down

is a quadratic relationship, represented by the equation below. A **quadratic relationship** exists when one variable depends on the square of another.

Quadratic Relationship Between Two Variables

$$y = ax^2 + bx + c$$

تربيعية

$F = \frac{mv^2}{r}$

Inverse relationships The graph in **Figure 18** shows how the time it takes to travel 300 km varies as a car's speed increases. This is an example of an inverse relationship, represented by the equation below. An **inverse relationship** is a hyperbolic relationship in which one variable depends on the inverse of the other variable.

Inverse Relationship Between Two Variables

$$y = \frac{a}{x}$$

18	A. Apply the equation of motion relating the final position of an object to its initial position, initial velocity, uniform acceleration, and time	example 4	70

$x_i = 0$

$v_i = 0$

EXAMPLE Problem 4

DISPLACEMENT An automobile starts at rest and accelerates at 3.5 m/s² after a traffic light turns green. How far will it have gone when it is traveling at 25 m/s?

a x_f v_f

$$v_f^2 = v_i^2 + 2a(x_f - x_i)$$

$$25^2 = \cancel{0} + (2 \times 3.5\, x_f)$$

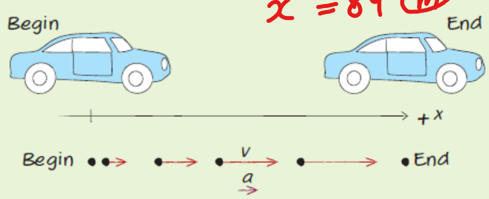
$$x = 89 \text{ m}$$

solve

1 ANALYZE AND SKETCH THE PROBLEM

- Sketch the situation.
- Establish coordinate axes. Let the positive direction be to the right.
- Draw a motion diagram.

KNOWN	UNKNOWN
$x_i = 0.00$ m	$x_f = ?$
$v_i = 0.00$ m/s	
$v_f = +25$ m/s	
$\bar{a} = a = +3.5$ m/s²	



2 SOLVE FOR THE UNKNOWN

Use the relationship among velocity, acceleration, and displacement to find x_f.

$$v_f^2 = v_i^2 + 2a(x_f - x_i)$$

$$x_f = x_i + \frac{v_f^2 - v_i^2}{2a}$$

$$= 0.00 \text{ m} + \frac{(+25 \text{ m/s})^2 - (0.00 \text{ m/s})^2}{2(+3.5 \text{ m/s}^2)}$$ Substitute $x_i = 0.00$ m, $v_f = +25$ m/s, $v_i = 0.00$ m/s, $a = +3.5$ m/s².

$$= +89 \text{ m}$$

3 EVALUATE THE ANSWER

- **Are the units correct?** Position is measured in meters.
- **Do the signs make sense?** The positive sign agrees with both the pictorial and physical models.
- **Is the magnitude realistic?** The displacement is almost the length of a football field. The result is reasonable because 25 m/s (about 55 mph) is fast.

19	Define and identify independent and dependent variables for a given data set	as mentioned in the book	18

Independent and dependent variables A variable is any factor that might affect the behavior of an experimental setup. The factor that is manipulated during an investigation is the **independent variable.** In the experiment that gave the data in **Table 3,** the mass was the independent variable. The factor that depends on the independent variable is the **dependent variable.** In this investigation, the amount the spring stretched depended on the mass, so the amount of stretch was the dependent variable.

mass	spring stretched
independent	dependent

20	Interpret a position-time graph that represents the motion of a single object Interpret a position-time graph that represents the motion of multiple objects	example problem 2	41

EXAMPLE Problem 2

INTERPRETING A GRAPH The graph to the right describes the motion of two runners moving along a straight path. The lines representing their motion are labeled A and B. When and where does runner B pass runner A?

1 ANALYZE THE PROBLEM

Restate the questions.

45

Question 1: At what time are runner A and runner B at the same position?

Question 2: What is the position of runner A and runner B at this time?

190

2 SOLVE FOR THE UNKNOWN

Question 1

Examine the graph to find the intersection of the line representing the motion of runner A with the line representing the motion of runner B. These lines intersect at time 45 s.

Question 2

Examine the graph to determine the position when the lines representing the motion of the runners intersect. The position of both runners is about 190 m from the origin.

Runner B passes runner A about 190 m beyond the origin, 45 s after A has passed the origin.